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## THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE PRELIMINARY ANNOUNCEMENT OF THE DENVER MEETING

Edited by Dr. F. R. MOULTON

PERMANENT SECRETARY

THIRTY-SIX years ago, in 1901, the fiftieth meeting of the association was held in Denver, Colorado. This year the one-hundredth meeting of the association will also be held in Denver, from June 21 to 26. The approaching meeting will be particularly important because for the first time the Pacific Division and the Southwestern Division will join in a meeting of the entire association. Many of the affiliated societies, both of the association and of its two divisions, are combining forces to make the one-hundredth meeting a memorable occasion.

At the fiftieth meeting of the association Dr. Charles Sedgwick Minot, of Harvard University, distinguished for his work in medical sciences, was president of the association. For the one-hundredth meeting another

Harvard University scientist is president, Dr. George D. Birkhoff, an internationally famous mathematician.

The local arrangements for the meeting are in charge of an executive committee, of which Dr. James J. Waring is chairman and Dr. J. C. Stearns is secretary. There is also a general committee for the meeting, composed of a large number of distinguished citizens of Denver and the surrounding region.

## THE DENVER REGION

(Material furnished by the Local Committee)

Denver, a city of about 300,000 population, is situated on the plains just east of the Rocky Mountains. This great barrier, and the altitude, one mile above

sea level, provide an unusual and most invigorating climate for the city.

Denver is, first and foremost, a residential city. It has no tenement district, no manufacturing or industrial population of any importance. Primarily, the business of the city is one of distribution: Denver is the clearing house for and trade center of a vast and rich district, the main products of which are cattle, metals, coal and foodstuffs.

Universities and colleges in the Denver area boast of student bodies entirely above the relative population of the district. Responsible for this are Colorado's matchless, year-around climate and unusual scenic attractions. The assurance of a delightful background and most pleasant environment for work and play, as well as the general excellence of these institutions of higher learning, lure students from all parts of the continent.

So close to the heart of the city are Denver's mountain parks that it is a matter of only minutes from the classroom to the magnificent playgrounds with their scenic delights and cool streams from higher altitudes. Paved roads radiate from down-town Denver into the mountain country that always is beckoning. It is never more than 45 miles from Denver's city hall to a glacier and perpetual snow.

Students of botany delight in the floral growth of the district, extending from plant life on the plains to the nearby watered lowlands and on up through a cascade of spring and summer ornamentation on the lofty mountain sides. Devotees of mineralogy are offered a rare natural laboratory for study. The same is true for those interested in wild animal and bird life. Although Colorado has the highest average altitude of any state in the union, it presents noteworthy variety—mysterious desert wastes with shifting sands that once were the bed of inland seas, grassy plains, the largest irrigated areas on the continent and the incomparable Colorado Rockies with their vast succession of peaks of more than 14,000 feet.

Denver is the center of a compact district offering ten major educational institutions. Largest of the educational institutions in Colorado's capital is the University of Denver. Its picturesque setting on the hill-top campus faces the mountain range. Students are offered courses in liberal arts, commerce, science and engineering, and fine arts and music. These, with the graduate school, the school of law, the summer school, school of librarianship, department of social work and the university college, make up a distinguished cultural organization.

Although the University of Colorado is located in near-by Boulder, it operates in Denver a widely known school of medicine and hospital admirably located and staffed. This school of medicine was opened in 1883.

In 1911 it was united with the Gross College of Medicine, the two faculties being combined into one. Since that time the growing single unit has been a division of the University of Colorado. On the campus at Boulder the state university, beautifully situated at the entrance to the mountains, offers many advantages for the student from other states. Its summer sessions are staffed with prominent educators from all parts of the country.

In Denver also is located Regis College, a long-established and distinctive college for men and boys.

An accredited college for women, of which Denver and Colorado are justly proud, is the Colorado Woman's College, located at Denver. About 12 miles from the heart of Denver is the Colorado State School of Mines, the largest institution of the kind in the world. Situated in the mountain foothills, at Golden, near where the first gold was discovered in Colorado, the 75-year old school boasts of students from most of the major countries of the world.

The Colorado State College of Agriculture and Mechanic Arts is at Fort Collins, 65 miles north of Denver. The Colorado State College of Education is at Greeley, only fifty miles from the capital. Colorado College, a large coeducational institution, offering the usual university subjects, is an endowed school, located at Colorado Springs at the foot of Pike's Peak, 75 miles to the south of Denver.

Preparatory schools, military academies, art institutions and schools operated in the mountain ranch country form a most intriguing chain of institutions designed for the upbuilding of mind and body of boys and girls; junior colleges and smaller "normals," scattered advantageously about the state, have their important place in Colorado's interesting educational life.

#### HEADQUARTERS AND REGISTRATION

General hotel headquarters for the association and for all groups meeting in Denver will be the Cosmopolitan Hotel, where the registration office for the meeting will also be located. This hotel is in the center of the business district, conveniently located to all places at which sessions will be held. The office of the permanent secretary will also be located in this hotel. Mail, telegrams, etc., may if desired be addressed to Registration Headquarters, A. A. A. S., Cosmopolitan Hotel, Denver.

Registration will be open upon payment of a fee of \$1.00 to all persons who are interested in the advancement of science and education. Each registrant will receive a copy of the program, an identification card and a badge. Registration will be necessary for attendance upon the general reception and participation in other events planned by the local committee. The registration office will be open for the convenience of



those arriving early on Sunday afternoon, June 20, from 2:00 to 5:00 o'clock.

#### HOTELS IN DENVER

Many of the hotels are cooperating with the association for the meeting. Members desiring accommodations are expected to communicate directly with the hotels. The following rates for rooms with bath will apply:

*Cosmopolitan*: (general headquarters): Single, \$3-\$5; double, \$5-\$8.

*Adams*: Single, \$2.50-\$3; double, \$3.50-\$4.

*Albany*: Double, \$4-\$8.

*Argonaut*: Single, \$2.50-\$4; double, \$4-\$7.

*Auditorium*: Single, \$2-\$3; double, \$3-\$4.50.

*Barth*: Single, \$2-\$2.50; double, \$3.50-\$4.

*Brown-Palace*: Single, \$3.50-\$4; double, \$6-\$8.

*Colorado*: Double, \$3-\$4.

*Cory*: Single, \$2.50-\$4; double, \$3.50-\$6.

*Crest*: Double, \$3.50-\$6.

*Dover*: Single, \$2-\$2.50; double, \$3-\$3.50.

*Oxford*: Single, \$2.50-\$3; double, \$3-\$5.

*Roosevelt*: Single, \$3-\$4; double, \$4-\$7.

*Sears*: Double, \$5-\$6.

*Shirley-Savoy*: Double, \$4-\$6.

*Standish*: Single, \$2-\$3.50; double, \$3-\$6.

Excepting the *Cosmopolitan*, *Brown-Palace*, *Cory* and *Sears*, all hotels have rooms without bath at considerably lower rates. The *Argonaut* will furnish suites to accommodate three or more persons at \$7.50 and up; the *Auditorium* will furnish two-room suites, with one bath, for four persons at \$6 to \$8.

#### TRANSPORTATION

Summer excursion railway fares will be in effect for the Denver meeting from all points in the United States. A few sample round-trip rates are as follows:

From	Season ticket	21-day ticket	Round-trip Pullman fare (extra)
Boston .....	\$100.15	\$93.35	\$28.00
Chicago .....	41.00	34.20	14.52
Detroit .....	56.70	49.90	18.00
New York .....	93.35	86.55	26.52
Philadelphia .....	88.15	81.35	25.52
Washington, D. C. ..	85.45	78.65	25.52

It is advisable for all who plan to attend the meeting to consult their local ticket agent for accurate information regarding the possibility of reduced fares for shorter periods than those above listed.

#### PRESS SERVICE

(From Austin H. Clark, Director)

Representatives of all sections of the press are co-operating with the association for the purpose of making known throughout the entire country, and also abroad, the proceedings of the Denver meeting.

We who are occupied with science in this country receive our support directly or indirectly from the American public. Year by year the public is becoming increasingly interested in what we are doing. Their knowledge of what we are doing comes to them through the medium of the press. So it is incumbent upon the members of the association to provide the press with all the material it may wish to use.

All who will present papers or addresses at Denver are requested to make sure that the Press Service is supplied with copies of their manuscripts as long in advance as possible. Two copies of each paper, each accompanied by an abstract, should be sent to the Press Service at Washington.

Manuscripts are made available for study by the representatives of the press as soon as received. The earlier they are received the more time there is to study them and to prepare full and accurate accounts of their contents. Early receipt of manuscripts is of great benefit and advantage to all concerned—especially the authors.

The Press Service is for your benefit, as well as for the benefit of the association and of science as a whole. Its success depends upon your cooperation.

#### GENERAL SESSIONS

On Tuesday evening Dr. Herbert M. Evans, professor of biology and director of the Institute of Experimental Biology of the University of California, will deliver his address as retiring president of the Pacific Division of the Association. The title of Dr. Evans's address is, "The Development of our Knowledge of Anterior Pituitary Function."

On Wednesday evening the Maiben Lecture will be delivered by Professor Nevil V. Sidgwick, F.R.S., of Lincoln College, Oxford, England. "Molecules" is the subject chosen by Professor Sidgwick for his address.

On Thursday evening, Dr. A. E. Douglass, professor of astronomy and director of the Steward Observatory of the University of Arizona, will deliver the John Wesley Powell lecture of the Southwestern Division. The subject of Dr. Douglass's address is "Tree-Rings and Chronology." These lectures and their addresses were described more at length in *SCIENCE* for April 30, 1937.

"The Scientific Aspects of the Control of Drifting Soils" is the topic chosen for the General Symposium on Thursday afternoon at 2 o'clock. This symposium is sponsored jointly by the Ecological Society of America and the Association. The geological aspect which deals with the origin and distribution of the soils in the Great Plains Region will be presented by Dr. M. M. Leighton, chief of the Illinois Geological Survey. The biological factors are to be treated by Dr. Frederic E. Clements, plant ecologist of the Carnegie Institu-

tion of Washington. The effects of man in disturbing established conditions and the organization of means of control form the subject of the third paper by Dr. H. H. Bennett, director of the Soil Conservation Service.

#### SOCIAL EVENTS

On Monday evening the local committee will give an informal reception to visiting scientists in honor of the officers and the members of the American Association. This reception will be held at the Reed Library of the University of Denver. A dinner for all biologists is scheduled for Wednesday evening. The Society for Research on Meteorites will have its dinner at six o'clock on Tuesday evening, and the American Society of Plant Physiologists will hold its dinner on Thursday evening. The local committee has planned for Friday afternoon a trip into the mountains, to be followed by a buffet supper. This excursion promises to be very attractive to all who are able to accept the invitation of the local committee. All visiting scientists are invited.

#### EXCURSIONS, FIELD TRIPS AND DEMONSTRATIONS

Since the region about Denver offers exceptional attractions for field studies in natural history, sections and societies are planning to take advantage of the opportunities afforded. Many field trips have already been organized in geology, biology and anthropology and by other groups, some of which are optional and some of which are necessarily limited to special groups or to a limited number of participants. Some information will be found in the announcements of programs, but precise data will be obtainable on registration in Denver. A number of exhibits and demonstrations are being planned by various societies and incorporated in their programs.

Saturday has been set aside for excursions to educational and other institutions in the region of Denver. These excursions will offer a splendid opportunity to those attending the meeting to become acquainted not only with the institutions but with the individuals and the work they are doing in their respective fields of science. Arrangements are being made for trips to Boulder, Colorado Springs, Fort Collins, Golden and other important points. Unfortunately one can not participate in all these excursions in one day. A desk in the registration office will be provided where reservations may be made.

#### OFFICIAL NOTICES

The executive committee of the association will meet on Sunday afternoon and evening, June 20, and the council will hold its first session on Monday at 2:00 P.M. Later sessions will be held at 9:00 o'clock on other days as decided. By rule, all business is pre-

sented to the council through the executive committee. Members are requested to forward items for the council to the permanent secretary's office in Washington until June 15. After that date items should be sent to the permanent secretary addressed to the Cosmopolitan Hotel, Denver, Colorado.

The executive committee of the Pacific Division will hold luncheon meetings daily from Monday to Friday at 12:15 P.M. The meeting of the affiliation committee of the Pacific Division will be held on Tuesday afternoon at 4:30. A general business session of the division will be held on Tuesday evening immediately after the general session of the association.

Full data regarding participants, time and place of various events and other details will be found in the official program of the meeting, which will be distributed to members on registration in Denver.

#### SECTION MEETINGS AND SOCIETY PROGRAMS

The Section on Mathematics (A) will hold a joint session with the Section on Social and Economic Sciences (K) and the Econometric Society on Thursday morning. Among those who will participate on the program are Professor J. A. Shohat, Dr. Gerhard Tintner and Professor G. C. Evans.

The Section on Physics (B) will hold a joint session with the American Physical Society, Pacific Coast Branch, for a symposium on "Cosmic Physics" on Saturday morning, with papers by Dr. Thomas H. Johnson, of the Bartol Research Foundation, and Professor Hurd C. Willett, of the Massachusetts Institute of Technology. A third paper for this symposium will be arranged.

The American Physical Society will meet on Friday and Saturday, holding sessions in conjunction with the Section on Physics (B) and the Astronomical Society of the Pacific and the Section on Astronomy (D). The session with the two latter organizations will probably consist of a symposium on "Solar Radiation and Radio Reception," and will be held on Friday morning. On Saturday morning the Physical Society will join with the symposium program of the Section on Physics (B). The Saturday afternoon session will be devoted to the presentation of short contributed papers.

The American Meteorological Society plans full-day sessions on Monday, Tuesday and Wednesday and, if necessary, forenoon sessions on Thursday and Friday. Papers dealing with air-mass analysis as applied to the western United States, the geometrical theory of halos, the auroral afterglow, atmospheric pressure at heights above 40 miles and the atmospheric factor in the "Dust Bowl" problem are some of those which will be up for discussion. On Thursday afternoon the members will join with the Ecologists for the an-



nounced program of that group. There will be opportunity for visits to points of meteorological interest.

The American Association of Physics Teachers will meet on Thursday morning and afternoon. The morning session will be occupied with papers contributed by members and the afternoon session by a special program of several invited papers.

The Hydrology Section of the American Geophysical Union will hold a joint session with the Society of American Foresters on Tuesday morning. Other sessions have been arranged for programs on the subjects of consumptive use and return flow, rainfall and runoff, physics of soil moisture, dynamics of streams and underground waters.

The Section on Chemistry (C) will hold three half-day sessions, in cooperation with local sections of the American Chemical Society. A number of interesting papers by individuals carrying on fundamental research have been arranged.

The Section on Astronomy (D) will hold joint sessions with the Astronomical Society of the Pacific and the Southwestern Division. A joint session with the Section on Physics (B) and the Astronomical Society of the Pacific is being arranged, to be held on Friday morning for a discussion of subjects of common interest.

The Astronomical Society of the Pacific and the Section on Astronomy (D) will hold two or more sessions for the presentation of papers on astronomical subjects, and on Friday morning will hold a joint session with the American Physical Society, the Section on Physics (B) and the Section on Astronomy, at which three invited papers will be presented on the general topic "Radio Transmission and Solar Phenomena."

The fifth annual meeting of the Society for Research on Meteorites will be held on Tuesday and Wednesday. "Meteorite Craters" will be the subject for a joint session with the Section on Geology and Geography (E) on Tuesday afternoon. At six o'clock on Wednesday evening, June 23, there will be a dinner for members and their guests at the Denver Athletic Club. The sessions will be held at the Colorado Museum of Natural History, where a large collection of meteorites will be on display for those interested.

The Section on Geology and Geography (E) will open its program on Tuesday afternoon, when it will meet jointly with the Society for Research on Meteorites. The remainder of the week will be devoted to papers and field trips, in all of which the varied aspects of Rocky Mountain geology will be featured. Wednesday morning has been set aside primarily for stratigraphic and structural papers, and Thursday morning will be utilized for the same purpose if further discussion of Rocky Mountain problems seems

more vital than a half-day field trip. An examination of foothills structures near Lyons, under the guidance of Dr. W. O. Thompson, and other members of the Department of Geology, University of Colorado, is scheduled for Wednesday afternoon; and local trips, featuring Mesozoic stratigraphy, structure and economic geology, will be arranged for Thursday morning if an indoor meeting does not prove more urgent. The general symposium on "The Scientific Aspects of the Control of Drifting Soils" is scheduled for Thursday afternoon, and in view of the wide-spread interest in this subject, the Section on Geology and Geography will not hold any competing meetings. On Friday morning a symposium on Rocky Mountain geomorphology has been arranged, at which papers covering varied phases of this field, and ranging geographically from New Mexico to Montana, will be presented. On Saturday morning, Dr. F. M. Van Tuyl will lead a geomorphic field excursion into the mountains, and the trip will end at Science Lodge, where the members of the section will be the luncheon guests of the University of Colorado's Geology Department. Among the speakers scheduled to present papers at the several sessions are Wallace W. Atwood, Margaret F. Boos, W. O. Thompson, F. M. Van Tuyl and P. G. Worcester, in addition to representatives from the Harvard, Iowa, Princeton, Smith, Wyoming and other university groups which are also carrying on field research in the Cordilleran region.

The Oceanographic Society of the Pacific will hold sessions for contributed papers on Wednesday afternoon and Thursday morning. The annual luncheon of the society will be held on Thursday at noon. A symposium has been arranged for Thursday afternoon on "Inter-relations of the Sciences Which Compose Oceanography," with papers by Professor H. U. Sverdrup, of the Scripps Institution of Oceanography at La Jolla, California; Professor A. H. Hutchinson, of the University of British Columbia, and Professor B. S. Henry, of the University of Washington.

The Section on the Zoological Sciences (F) will meet on Tuesday, Wednesday and Thursday. The sessions on Tuesday have been assigned to Parasitology, with a general session in the morning and a symposium in the afternoon. The program for Tuesday is being arranged by Professor John W. Scott, of the University of Wyoming. On Wednesday and Thursday mornings papers of general zoological interest are to be presented. Wednesday afternoon has been tentatively set aside for demonstrations. On Thursday afternoon the section joins with the General A. A. A. S. Symposium, arranged by the Ecological Society, on the subject of "The Scientific Aspects of Drifting Soils." Members of the section are invited to a complimentary luncheon at Science Lodge, near Boulder,



on Saturday. Correspondence regarding the program and titles submitted for the general session should be addressed to the secretary of the section, Professor George A. Baitzell, Yale University.

The American Association of Economic Entomologists will meet on Thursday and Friday. The sessions will open with a brief business meeting, followed by presentation of papers. There will be sessions for papers on Friday afternoon and on Saturday morning and afternoon. The Entomologists' dinner will be held at 6 o'clock on Thursday.

The American Society of Parasitologists will be represented by a program on Tuesday. The morning session will be devoted to the reading of papers, including invited papers on *Diphyllbothrium latum* and closely related species found in North America. The speakers will include Dr. William L. Jellison, Dr. T. B. Magath, Dr. Justus F. Mueller and Dr. John W. Scott. At the afternoon session a symposium on "Rocky Mountain Spotted Fever" will include papers by Dr. R. R. Parker, director of the Rocky Mountain Spotted Fever Laboratory, Dr. Cornelius B. Philip, Dr. Herald R. Cox and one other speaker on "Sylvatic Plague."

The American Society of Ichthyologists and Herpetologists (Western Division) will devote its sessions on Tuesday morning and afternoon to fisheries problems and papers on the habits, taxonomy and distribution of reptiles, amphibians and fishes.

The Section on Botanical Sciences (G) will meet in joint session with the Western Section of the American Society of Plant Physiologists, the Pacific Section of the American Phytopathological Society, the Pacific Section of the Botanical Society of America and the Western Society of Naturalists on Wednesday afternoon, June 23. The program will include a group of invitation papers. Dr. Frederic E. Clements, of the Carnegie Institution of Washington, will give an illustrated address on environment and expression in species. Dr. A. R. Davis, of the University of California, will discuss his investigation of the interrelationships of environmental variables in plant growth. Dr. J. T. Barrett, of the University of California, will give a report on his studies of the lower forms of parasitic Phycomycetes. Dr. L. L. Burlingame, of Stanford University, will speak on the anomalous inheritance of white anther in *Clarkia elegans*. Dr. R. B. Harvey, of the University of Minnesota, will give a talk on winter resistance in plants.

The American Phytopathological Society will hold sessions for the presentation of papers on Wednesday morning and Thursday under the auspices of the Pacific Division. Wednesday afternoon will be devoted to a joint meeting of the Section on Botanical Sciences, at which Dr. J. T. Barrett, of the Univer-

sity of California, representing the Phytopathological Society, will present a paper on "Observations on New or Little-known Phycomycete Root Parasites." On Friday and Saturday plant pathologists of the Pacific Division have been invited to participate in a meeting of the Upper Mississippi Valley group to be held in Estes Park. This meeting will consist of group discussions, presentation of invitation papers and optional scenic trips.

The American Society of Plant Physiologists, in joint session with the Western Section of the society, will begin its meetings on Tuesday morning, with a symposium on "Chlorosis" conducted by Dr. W. W. Aldrich. The Western Society of Soil Science has tentatively arranged to join in this meeting. Tuesday afternoon will be devoted to short papers. On Wednesday morning, Dr. F. W. Went will conduct a symposium on "Plant Hormones." This will be followed with a luncheon to which all those particularly interested in the details of hormone research will meet and discuss the problem further. In the afternoon, the society will join with the other affiliated societies for a meeting of the Section on Botanical Sciences. One of the speakers is Dr. Frederic E. Clements, who will speak on "Environment and Expression in Species." This meeting will be followed by the Biologists' dinner. On Thursday morning, Dr. A. H. Hendrickson will conduct a symposium on "Drought Resistance in Plants." Thursday afternoon and Friday morning will be devoted to short papers. On Thursday evening the plant physiologists will have a dinner, to be followed with an address by the president of the society, Dr. R. B. Harvey. Friday afternoon and evening will be spent in sight-seeing and picnicking.

The American Fern Society will not hold an indoor meeting for the reading of papers, but will take a field trip to study some of the notable ferns of the Boulder Canyon on Sunday, June 20, and/or Monday, June 21.

The Ecological Society of America will hold two sessions, one of which will be a symposium on "Conservation Management of Wildlife," on Wednesday morning, presided over by Dr. H. L. Shantz, director of the U. S. Division of Wildlife Management, with three other speakers from the states of Colorado, Wyoming and Utah. On Thursday morning, a session will be held for presentation of papers. The general symposium, under the joint auspices of the society and the American Association, will be held on Thursday afternoon, on "The Scientific Aspects of the Control of Drifting Soils," including various features of conservation in the Great Plains. The society has arranged a Biologists' Dinner, without speeches, for Wednesday evening, preceding the evening lecture of the association. Field trips will be a special feature of the program. These will be under the guidance of



botanists, zoologists, geologists and others, who will explain matters of interest in biology, geology, conservation projects and scenic features. On Tuesday, an all-day excursion will be made through the Denver mountain parks to Echo Lake and the summit of Mt. Evans. The foothills of the Rockies, the montane zone, timberline and the alpine region will be visited. On Wednesday afternoon, a four-hour excursion will be made to the Garden of the Red Rocks and Lookout Mountain. The Great Plains and the foothills will be considered. For the week-end of Saturday-Sunday, June 26-27, a choice of two excursions may be made. If desired, portions only of these may be taken. One trip will be to the Colorado Springs and Pike's Peak region, with visits to the U. S. Soil Conservation projects near the Springs, and to the Alpine Laboratory of the Carnegie Institution of Washington, on the slopes of Pike's Peak, with its transplant gardens. Scenic features will include the Garden of the Gods, South Cheyenne Canyon and Seven Falls, and Pike's Peak. The other week-end excursion will be to the Rocky Mountain National Park, to observe various types of vegetation and animal life in different altitudinal zones of the Rockies, and spending Saturday night at Science Lodge of the University of Colorado at 9,500 feet elevation.

The Western Society of Naturalists will meet jointly with the Section on Botanical Sciences, with one speaker to represent the society on the program. There will be another session for presentation of papers. Members of the society will join with other biologists in the Biologists' Dinner to be held on Wednesday evening.

The Section on Anthropology (H) will meet on Wednesday and Thursday. The Department of Indian Art of the Denver Art Museum will be host to the section. The program will be built around the relationships, or lack of them, between the Plains, Southwest, Texas and Southern California areas, with discussions concerning relative chronologies and influences. It is planned to spend Friday visiting the Lindenmeier Folsom Site and the archeological collections at the University of Colorado. If there is sufficient interest, a trip will be made on Saturday to Colorado Springs to visit the new Taylor Museum for Southwestern studies, Colorado College and other institutions in that city. Time will be allowed for visiting the Indian exhibits of the Art Museum, the State Historical Society, the Colorado Museum of Natural History and the Department of Anthropology of the University of Denver.

The Section on Psychology (I) will hold sessions on Monday and Tuesday. There will be papers from leading psychologists throughout the West, including the Rocky Mountain region, the Southwest and the

Pacific Coast. Included in these sessions will be a dinner meeting at the Cosmopolitan Hotel. Other features will be symposia on topics of vital interest in psychology, excursions to Rocky Mountain parks, a visit to the High Altitude Laboratory on Mt. Evans, and visits to psychology laboratories in adjacent institutions, such as the University of Colorado at Boulder, Colorado State College at Ft. Collins, Colorado College at Colorado Springs, and the Colorado State College of Education at Greeley.

The Section on Social and Economic Sciences (K) will feature joint meetings of affiliated and related societies, including the Econometric Society, the American Statistical Association, the Sociological Research Association and Pi Gamma Mu, honorary social science society. On Thursday evening the participating societies will unite in a general meeting, to be addressed by Dr. Carl Snyder, for many years with the Federal Reserve Bank in New York, who will speak on "New Foundations for an Economic Science." Dr. Stuart A. Rice, of the Central Statistical Board, will preside. A luncheon meeting on Friday will be addressed by Dr. George Gallup, conductor of nationwide surveys of popular reaction to public questions, on "Measuring Public Opinion." His paper will be discussed by Dr. Claude Robinson and Dr. Louis Bean. The meeting will be open to all psychologists, sociologists, statisticians and other interested scientists.

Three sessions are scheduled by the Econometric Society: the first in joint session with the Section on Mathematics (A) on "Mathematical Economics," on Thursday morning, under the chairmanship of Dr. C. F. Roos, of the Mercer Allied Corporation, with Professors G. C. Evans, of the University of California, H. T. Davis, of Indiana University, and Gerhard Tintner, of the Cowles Foundation, as speakers; the second on Thursday afternoon in association with the Section on Mathematics and the American Statistical Association, the topic to be "Mathematical Probability and Statistics," with Dr. E. R. Hedrick, of the University of California at Los Angeles, acting as chairman, and speakers including Professors J. Shohat, the University of Pennsylvania, Holbrook Working, Stanford University, and E. L. Dodd, the University of Texas; the third scheduled Saturday morning on "Inflation," to include James Harvey Rogers, of Yale University, and Lionel Edie, of the Capitol Research Company.

In addition to joining with the Econometric Society on Friday morning, the American Statistical Association has arranged a session for Thursday morning on the subject of "The Organization and Technique of National Statistical Surveys" and a session for Friday morning on the subject of "Family Expenditures, Public Health and Social Security."



The Section on Engineering (M) plans to hold a group of independent and joint sessions, under the leadership of a special committee of the Colorado Engineering Council and with the cooperation of the Foresters Association. The Engineering Section meeting is planned for Monday afternoon, June 21, followed by foresters' meetings on Tuesday and Wednesday, all day, June 22 and 23. On Thursday, June 24, there will be inspection trips, one for the engineers and one for the foresters. A program of mutual interest to both engineers and foresters is being arranged with the desire that both engineers and foresters attend in common the meetings arranged by each. The Section on Engineering is fortunate in securing the cooperation of the Colorado Engineering Council, which comprises within its membership the local membership of the national professional engineering societies. Arrangements for the meetings are in charge of a committee of the Colorado Engineering Council, headed by Dana E. Kepner, of 1921 Blake Street, Denver, Colorado.

The Institute of the Aeronautical Sciences is organizing a session of invited papers by Dr. W. R. Gregg, chief of the U. S. Weather Bureau, Colonel Edgar S. Gorrell, president of the Air Transport Association of America, Mr. Fred D. Fogg, director of Air Commerce, U. S. Department of Commerce, and Dr. Clark B. Millikan, of the California Institute of Technology. The session is tentatively scheduled for Tuesday afternoon.

The Section on Medical Sciences (N) will hold sessions on Tuesday, Wednesday, Thursday and Friday. On Monday morning there will be a joint program with the Southern California Section and the Pacific Coast Section of the Society for Experimental Biology and Medicine. Several excellent papers have been arranged for this program from the fields of physiological chemistry, physiology and psychiatry. Workers associated with the Childs Research Council will present a summary of their recent findings. The studies from this group have been of inestimable value to the pediatrician. The afternoon session on Monday will be held jointly with Section N<sub>2</sub>, the Subsection on Pharmacy. Included on the program is a paper by F. E. Garlough, of the U. S. Biological Survey, dealing with the "Variation in the Response of Certain Birds and Mammals to Strychnine." This is one of a series of studies on the alkaloid, strychnine. Dr. Edward Jackson, professor emeritus of ophthalmology in the University of Colorado, will discuss "Physiology and Disorders of Equilibrium." It may be recalled that Dr. Jackson is the founder of the *Journal of Ophthalmology* and has been an outstanding leader in his special field for many years.

The programs on Tuesday, Wednesday and Thurs-

day, which will extend from 10 o'clock to one o'clock, will be devoted to a "Symposium on Diseases Caused by Acid-Fast Bacteria." The Tuesday session will be of an introductory nature, in which the common bacterial, chemical and pathological characteristics of the members of the acid-fast group will be reviewed. The chief point in the meeting is to bring out the fact that all the acid-fast organisms, regardless of what disease they cause, have some characteristics in common. A number of distinguished workers will be represented on the program. Dr. Florence R. Sabin, of the Rockefeller Institute for Medical Research, will cover the subject from the point of view of cellular pathology. Dr. Sabin's outstanding contributions in this field are too well known to require further comment. There will be several papers in which groups of workers have combined in an effort to give as thorough a review of the subject as our present knowledge warrants. The combination papers are indicative of the cooperative spirit of scientific investigation in the various laboratories in the country. The sessions will be brought to a close by a general discussion, with Dr. Harry J. Corper in charge.

The second day of the symposium will be devoted to a consideration of specific diseases and is listed as "Tuberculosis and Other Animal Diseases of Acid-Fast Origin." The first paper, "Tuberculosis in Domestic Animals," by Dr. George W. Stiles, associate bacteriologist of the U. S. Bureau of Animal Industry, will be followed by a joint paper on the "Tuberculin Reaction in Cattle and No-lesion Reactions." Drs. William H. Feldman, Arthur B. Crawford and L. L. Daines will each cover certain phases of this general subject. The next topic will be a review by Dr. Joseph D. Aronson, of "Tuberculosis in Cold-Blood Animals." Dr. Aronson is particularly qualified to present this subject because of his exhaustive research in this particular field. "John's Disease" is a malady of cattle that has been extensively studied at Cornell University for many years, and Dr. W. A. Hagen will discuss this disease. The papers of this session will be summarized by Dr. William Charles White, chairman of the Committee on Medical Research of the National Tuberculosis Association.

Thursday will be turned over to the subject of "Leprosy," a condition universally associated with Hansen's bacillus. A program has been developed with the aid of the Medical Advisory Board of the American Leprosy Foundation (Leonard Wood Memorial) and promises to be of unusual interest. This is probably the first time an attempt has been made in the United States to bring together the outstanding American workers in this field. Following papers on "Geographical Distribution," "Epidemiology," "Bacteriology and Immunology," "Cultivation" and



"Institutional Segregation," Mr. Perry Burgess, president of the foundation, will close the symposium with a general discussion. Mr. Burgess's knowledge of leprosy as a world problem will be of great value in bringing together the various aspects of this disease.

The program on Friday will be opened by an address commemorating the work and life of Henry Sewall, a distinguished physiologist who died last year. This memorial address will be followed by a series of research and clinical papers dealing with various phases of human tuberculosis and diseases of the chest. The Colorado workers have arranged the program, and through Dr. James J. Waring, chairman of the committee on local arrangements, a cordial invitation has been extended to all who wish to visit the various departments of the Medical School to make their desires known and guides will be provided.

The Society for Experimental Biology and Medicine, Southern California and Pacific Coast Sections, will hold a joint session with the Section on Medical Sciences (N) on Monday morning. The program will consist of papers limited to ten minutes each.

The Section on Agriculture (O), in cooperation with the faculty of Colorado State College, will give a program of papers dealing with the scientific background of agricultural development in the Rocky Mountain region. This will include presentations of the geologic and edaphic characteristics of the area, water supply and related problems, range, horticultural and agronomic resources, each given by specialists within their respective fields. Sessions will be held on Wednesday afternoon and Thursday morning. On Friday and Saturday an agricultural field tour will visit the Colorado Agricultural Experiment Station at Fort Collins, the U. S. Department of Agriculture Horticultural Field Station and Dry Land Experiment Station near Cheyenne, Wyoming, and the Agricultural Experiment Station of the University of Wyoming at Laramie. Return to Denver will be via Rocky Mountain National Park. If desired, stops will be arranged at field projects of the Soil Conservation Service and the Resettlement Administration.

The Society of American Foresters will hold sessions

during the period of the meeting. Opportunity will thus be afforded for contact and joint activity with the various sections and societies in which members of the society are interested. A program is being prepared that will feature some of the phases of forestry that are of national importance. This will take the form of a symposium on "Forests and Waters." Field trips will be arranged that will give an opportunity to see at first hand some of the problems and the work in forestry that are distinctive in this region. Many scenic and scientific attractions in the mountains of Colorado will repay visitors for their trip. This will be the first official visit of the society in the Rocky Mountains, and, accordingly, will offer many members the opportunity for exploration in virgin territory so far as forestry is concerned. Joint sessions will be held with the Section on Engineering (M) on Monday afternoon and with the Hydrology Section of the American Geophysical Union on Tuesday.

The Western Society of Soil Science, which regularly meets with the Pacific Division, will hold sessions at Denver on June 21 and 22.

The Section on Education (Q) has organized a special committee for the purpose of carrying out a strong and effective program. The local secretary for the section is Mr. Charles E. Greene, assistant superintendent of schools of Denver.

The National Social Science Honor Society, Pi Gamma Mu, will hold a luncheon on Thursday at 12 o'clock at the Cosmopolitan Hotel.

In conformity with the recently developed policy of the American Association of University Professors to hold regional conferences, one or two half-day sessions are being planned for the region which includes Colorado, New Mexico, Utah and Wyoming, in order to arouse a greater consciousness in teachers of the work being carried on by that organization. The program will include papers representative of both teaching and administration. It is hoped that President Carlson will take an active part. Although the meeting is being called as a regional one, it is hoped that all members attending the Denver meeting will join in making it a real success.

## OBITUARY

### MILTON JAY GREENMAN

WHEN a visitor to the Wistar Institute entered the office of the director, he found a genial, alert man, trained in biology, gifted to an unusual degree with mechanical and inventive abilities, with business capacity and good judgment, based on the imagination needed for an administrator. Thus Dr. Greenman was peculiarly fitted to bear his many responsibilities.

He died on April 7, in his seventy-first year, failing rapidly in the few weeks before his death—and the institute thus lost its real scientific founder, to the sorrow of all those associated with him.

In 1892 he graduated in medicine from the University of Pennsylvania, and became at once associated with Dr. Horace Jayne in the biological work at the university. In 1893 Dr. Jayne became director of the

Wistar Institute, and Dr. Greenman was associated with him as assistant director.

During this period he made a remarkable preparation of the bones of the human skeleton, which now forms an exhibition of these structures quite unequaled in detail and elegance.

On the retirement of Dr. Jayne, in 1905, he was made director of the institute. This brought him in direct contact with General Isaac J. Wistar, the founder of the institute, and under him he developed his business training.

Almost at once he began to consider the problems of the further development of the institute, which, in the earlier years, had grown more as a museum than as a center for investigation. Pursuing this idea, a group of ten anatomists was called in council, and a plan for the research work drawn up. This work began in 1906, and, with the aid of the Advisory Board formed from the original group of advisers, has continued ever since.

Following the purpose of making the institute helpful to the biologists of the country, Dr. Greenman began taking over the responsibility for the publication of a biological journal. The first experiment was made with the *Journal of Morphology*. Then, gradually, other journals were added until, at the present time, eight such journals have been acquired and are published, together with the bibliographic cards referring to them.

This step brought up the problem of printing, and through the generosity of a member of the board of managers, a suitable printing plant was established.

From the beginning of the laboratory work the albino rat had been used as the animal of choice. Large numbers of these had to be kept, and well kept. Here again, through the generosity of a member of the board, an adequate colony house was built for these animals, not only to furnish those used in the institute laboratories, but also to permit distribution to other laboratories working with these animals.

In 1916-17, Dr. Greenman turned aside for a time, to make two excellent studies on the nervous system of the rat. However, increasing executive duties prevented him from further work in this field.

The problem of the welfare of the rats was always before him, and to supply fresh food and pure water, a station was required in the country, where these conditions could be met. In 1928 this was accomplished by the establishment of the Effingham B. Morris Biological Farm, near Bristol, and about thirty miles from Philadelphia. Through the generosity of Mr. Morris, this station developed rapidly, furnishing buildings not only for laboratories, but for the culture of amphibians and for the rearing of the opossum—a project in which Dr. Greenman had been interested

for many years. Thus was added a division of the institute which called for much administrative care. Here Dr. Greenman had his home.

He acted as secretary of the board of managers, who were his devoted friends and admirers, and it was through them that many activities not warranted by the resources of the institute were made possible.

Dr. Greenman has left behind him an unusual record of achievements directed to the advance of biology and of biologists the world over. His work will be long remembered.

HENRY H. DONALDSON

#### RECENT DEATHS AND MEMORIALS

DR. ELIAS POTTER LYON, professor of physiology at the University of Minnesota, who resigned last year as dean of the Medical School, died suddenly on May 4. He was in his seventieth year.

DR. CHARLES LINCOLN EDWARDS, since 1912 supervisor of the department of nature study of the Los Angeles schools, previously from 1894 to 1912 successively professor of biology at the University of Texas, the University of Cincinnati, Trinity College, Conn., and the University of Southern California, died on May 6. He was seventy-three years old.

DR. GEORGE HENRY FOX, formerly professor of dermatology at the College of Physicians and Surgeons, Columbia University, died on May 3 at the age of ninety years.

DR. ALBERT WILLIAM BORTHWICK, professor of forestry at the University of Aberdeen, died on April 19 at the age of sixty-four years.

In the presence of five hundred persons, including members of the American Explorers Club and the American Polar Society, *The General A. W. Greely*, a three-masted schooner, in which a party of meteorologists under the leadership of Clifford J. MacGregor, of the Weather Bureau at Newark Airport, will sail for the Arctic on June 25, was christened on May 2 at Port Newark, N. J. Mrs. Gertrude Greely Sheed, a daughter of General Greely, after whom the ship was named, broke a bottle of champagne over the prow.

THREE trees were planted in front of the Franklin Institute of Philadelphia on May 1 in honor of Benjamin Franklin and two contemporary botanists, John and William Bartram. The trees, known as "Frankliniae Altamahas," were presented to the institute by Charles F. Jenkins, of Kitchen's Lane, Germantown. There were officially accepted at the ceremony by Henry Butler Allen, director of the institute. Miss Elizabeth C. White, of White's Bog, N. J., who has watched the growth of the young trees, and Arthur N. Leeds, of the Academy of Natural Sciences, also spoke briefly.



## SCIENTIFIC EVENTS

## THE INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

THE meeting of the International Council of Scientific Unions, which met this year for the first time in Great Britain, opened in London on April 26 with an informal reception by the president and fellows of the Royal Society. The delegates were received by Sir William Bragg, president of the society, and Dr. N.E. Nörlund, of Copenhagen, delivered his address as president of the council. His subject was "The Figure of the Earth." Lectures were given by Sir William Bragg on "Classical Experiments made at the Royal Institution" and by Professor E. V. Appleton on "International Cooperation in Radio Research." On the following day an official reception was given by the University of London at which the degree of doctor of science was conferred on Dr. Nörlund.

On April 27, Ramsay Macdonald, Lord President of the council, and Miss Macdonald received the delegates on behalf of the government at Lancaster House, and visits were made to the laboratories at the colleges of London University, research institutions, museums and the Broadcasting House. The sessions closed officially on May 3. The delegates were invited to attend the soiree of the Royal Society on May 4.

The International Council was established in 1919 to take the place of the International Association of Academies, which had lapsed during the war; it meets every three years, its membership being drawn from forty-two countries. The scientific unions, representing astronomy, geodesy and geophysics, chemistry, physics, scientific radio, geography and the biological sciences, present reports to the council at the time of the meeting, and during the three years interim pursue their activities as separate international bodies in affiliation with the council. At the meeting in London the Royal Society of Amsterdam proposed that a committee should be appointed to study what cooperation can be achieved in regard to the social responsibilities of science and scientific workers towards the dangers menacing the future of civilization. The council also had under consideration the report of the standing committee on the study of solar and terrestrial phenomena, and the report of the committee on the relations that should exist between the council and the Committee of Intellectual Cooperation of the League of Nations on matters concerned with international science.

## THE BRITISH ASSOCIATION AT NOTTINGHAM

THE British Association for the Advancement of Science has issued a preliminary program of arrangements for the annual meeting, which will be held this year at Nottingham from September 1 to 8. Accord-

ing to an abstract of this program in the *London Times*, Professor Sir Edward Poulton, in his presidential address, will deal with the history of evolutionary thought as recorded in the meetings of the British Association.

In the sectional programs many of the subjects to be discussed have been marked for inclusion in the series dealing with science and the public welfare. Among them are the sex ratio, which Professor F. A. E. Crew will discuss in his presidential address to the Zoology Section; the changing distribution of population, with which Professor C. B. Fawcett will deal in his presidential address to the Geography Section, and the modern study of plants in relation to education, on which Professor E. J. Salisbury will speak in his presidential address to the Botany Section.

The informative content of education will be the subject of H. G. Wells's presidential address to the Educational Science Section. J. M. Caie will address the Agriculture Section on state intervention in agriculture. Noise and the nation will be the subject of the presidential address of Dr. G. W. C. Kaye to the Mathematical and Physical Sciences Section, and economic research and industrial policy of Professor P. Sargent Florence before the Economics Section. Tests in common use for the diagnosis of color defect will be dealt with by Dr. Mary Collins in her presidential address to the Psychology Section.

Among other subjects which have been included in the series are x-ray methods and industry, problems of labor transference, the contribution of physiology to the health of the individual and the community, adult education, the problem of costs of distribution, the human factor in industry, industrial physics, chemistry and building research, motor vehicles and road safety, physiology as a subject of general education, planning the land of Britain and vulnerability of the national power supply.

Other sectional presidential addresses include those of Dr. F. L. Pyman (Chemistry Section), on recent research in chemotherapy; Sir Alexander Gibb (Engineering Section), on research in engineering; Professor L. J. Wills (Geology Section), on the Pleistocene history of the West Midlands; Dr. J. H. Hutton (Anthropology Section), on Assam origins in relation to Oceania, and Dr. E. P. Poulton (Physiology Section), on metabolism, nutrition and growth in man—some new views.

## THE EDGAR FAHS SMITH COLLECTION OF CHEMICAL MEMORABILIA

AN endowment fund of \$50,000 for the maintenance and future development of the collection of chemical memorabilia assembled by the late Dr. Edgar Fahs Smith, formerly professor of chemistry and provost



of the University of Pennsylvania, has been established by Mrs. Smith. It was through her generosity that the collection was presented to the university following the death in 1928 of Dr. Smith.

Since its acquisition the collection has been housed in several rooms of the John Harrison Laboratory of Chemistry which were occupied by Dr. Smith for many years, but frequent additions to the original collection have made it increasingly difficult to exhibit it satisfactorily in its present quarters. Coupled with this factor is a desire on the part of the university to provide additional space for the convenience of a constantly increasing number of students from this country and abroad who come to consult it. As a result, it is planned to collect funds as part of the bicentennial campaign of the university for a chemical museum sufficiently large to accommodate the collection and to allow for its future growth.

The collection of more than 7,000 items contains books on alchemy and chemistry, many of which are in Latin, German and old French; autograph letters and manuscripts of distinguished chemists of all nationalities; portrait prints and engravings of chemists from the days of alchemy to the present, and chemical preparations and apparatus. Included also are many rare books and manuscripts relating to the early history of the University of Pennsylvania and to its alumni, faculty members and trustees who were prominent in national affairs.

The collection on the history of chemistry has grown to nearly 10,000 items as a result of frequent gifts. It includes a copy of the "Alchemy" of Geber, printed in Latin in 1545. The first edition of "The Truth and Antiquity of Chemistry" by Robert Vallensis, published in Latin in 1561, said to be the first attempt at a history of chemistry ever made, was given by Professor Walter T. Taggart, of the university. The "Theatrum Chemicum," compiled by Elias Ashmole and published in London in 1652, is represented by a copy in its original binding. Contained in this copy, which was once part of the library of Sir Isaac Newton and which still bears his book-plate, are the "Ordinall of Alchemy," by Thomas Norton, and a poem by Chaucer dealing with the mysteries of alchemy. The book-plate of Lord Cornwallis is found in a volume by Bomare, published in 1768. The autograph of Samuel Taylor Coleridge appears in Barchusen's "Elements of Chemistry" published in 1718. Of Boerhaave's "Elements of Chemistry" there is a copy of the 1732 edition which he personally autographed. Represented by letters and manuscripts bearing their signatures are Priestley, Pasteur, Madame Curie and others. There are also a large number of portrait prints and engravings of prominent chemists.

The collection crosses the borderline into medicine to Paracelsus and the iatro-chemists, and later into physics with Thomas Graham and others, one of the most recent acquisitions being autograph letters of Sir Oliver Lodge and Dr. Max Planck.

The Smith collection also contains autograph letters from ten signers of the Declaration of Independence—Robert Morris, Benjamin Franklin, George Clymer, James Wilson, Benjamin Rush, Thomas McKean, John Penn, Francis Hopkinson, William Paca and James Smith, all of whom were either trustees or alumni of the University of Pennsylvania. There are autograph letters from General Anthony Wayne and Tech Tilghman, graduates of the university.

### THE BOTANICAL COLLECTIONS OF HARVARD UNIVERSITY

*The Harvard Alumni Bulletin* reports that a thorough renovation of the Arnold Arboretum in Jamaica Plain and the Harvard Botanic Garden in Cambridge has been under way during the past year.

Approximately 600 new shrubs and trees have been added to the permanent plantings of the arboretum, and extensive repairs made on the roads, paths and benches.

The grounds of the Botanic Garden have been thoroughly gone over and replanted. The growth about the Gray Herbarium building was removed, and replaced with selected shrubs from the arboretum. The old rock garden was torn up and a new one established, the overgrown iris plantings thinned out and reestablished on a new site, and the old area replaced with a lawn. The number of beds for annual and perennial plants was reduced, and the growing stock of the garden reinforced by shrubs from the arboretum.

The greenhouses were removed, and most of the plants sent to the Atkins Institution in Cuba, the roof greenhouses of the Biological Laboratory and the Bussey Institution. The remaining stock was given to the Massachusetts State College, Boston Teachers College, Wellesley College and the Boston Park Department.

Professor Elmer D. Merrill, administrator of the Harvard Botanical Collections, also says in his annual report that during the year the Arnold Arboretum distributed to other institutions 1,400 packages of seeds and scions and cuttings of 900 species and varieties of shrubs and trees. Accessions to the arboretum included 450 packets of seeds, 600 scions and cuttings and 1,900 plants.

The herbarium received important collections from China, Malaysia, India, Australia, Africa, Mexico, Central America and South America. These additions brought the total number of specimens to 430,000.



## THE FIELD MUSEUM OF NATURAL HISTORY

THE annual report of the director of the Field Museum of Natural History, Chicago, for the year 1936 has been published. This is the last report of the late Stephen C. Simms, formerly director, who died on January 28.

The report opens with a statement calling attention to the financial needs of the museum. In 1936, and during several preceding years, the growth and development of the museum has been seriously menaced by decreases in nearly all sources of income. Returns from corporate securities in which endowment funds have been invested, from taxes levied for the maintenance of museums, from paid admissions, from fees paid for museum memberships and contributions received from public-spirited citizens, all have been far below former years and below the needs of the institution. If the museum is to carry on its expeditions, research and dissemination of knowledge and its services to the public of Chicago and the Middle West, increases in revenue must be obtained. Among the larger contributions received during the year were securities valued at \$85,000 from Albert W. Harris, \$74,626 from Marshall Field, of New York, and \$59,82 from Stanley Field, president of the museum.

The number of visitors during 1936 was 1,191,437, representing a small increase over 1935, when attendance was 1,182,349. Of the total number of visitors, only 68,375, or less than 6 per cent., paid the twenty-five cent admission fee charged on certain days. The others came on free days or belonged to classes such as children, students and teachers, to whom admission is free.

The educational influence of the museum was extended by extra-mural activities directed principally toward reaching school children. One division of the museum, the James Nelson and Anna Louise Raymond Foundation, sent lecturers to 444 school assemblies. Traveling exhibits, circulated among 446 schools and other institutions through the Department of the N. W. Harris Public School Extension, reached approximately 700,000 children in public, parochial and private schools and in community centers. The spring and autumn lecture courses for adults, the Raymond Foundation's free-motion picture programs for children in the James Simpson Theater of the museum and the guide-lecture tours of the exhibits, attracted audiences of 78,711 persons. The library of scientific publications, which is open to the public for reference, was increased to approximately 105,000 volumes. Each of the scientific departments continued to provide collections of study specimens for use as reference material by teachers, students and others.

The report contains detailed accounts of new exhibits, accessions, research and other activities of the departments of anthropology, botany, geology and zoology and the various other divisions of the museum. There is also a complete list of its 4,238 members.

## THE MEDAL MEETING OF THE FRANKLIN INSTITUTE

THE medal meeting of the Franklin Institute of Philadelphia will be held on Wednesday afternoon, May 19, at 3:30 P. M. As has already been reported in *SCIENCE*, the Franklin Gold Medal and certificate of honorary membership will be awarded to Dr. Robert A. Millikan, director of the Norman Bridge Laboratory of Physics and chairman of the Executive Council of the California Institute of Technology, and to Dr. Peter Joseph Wilhelm Debye, director of the Kaiser Wilhelm Institute of Physics, Berlin.

The Franklin Medal is awarded annually from the Franklin Medal Fund, founded on January 1, 1914, by Samuel Insull, "to those workers in physical science or technology, without regard to country, whose efforts, in the opinion of the institute, acting through its Committee on Science and the Arts, have done most to advance a knowledge of physical science or its applications."

The award is made to Dr. Millikan "In recognition of his isolation and measurement of the fundamental unit of electricity, the electron; the photoelectric determination of the fundamental constant of radiation, Planck's constant; the extension of the ultra-violet spectrum by two octaves to join the spectrum of soft x-rays; and the study of the nature and the properties of a very penetrating radiation of cosmic origin."

Dr. Debye will receive the medal "In recognition of his fundamental conception and masterly development of the theory that the molecules of many substances possess permanent dipole moments—a theory of great value in stimulating a vast amount of fruitful research on the electrical properties of insulators; his extension and generalization of Einstein's theory of the specific heats of solids, and his work, in collaboration with Huckel, on a theory of the thermodynamic properties of electrolytic solutions, work upon which the whole modern theory of electrolytes is based."

In addition to the Franklin Medal the following medals will be awarded:

*The Longstreth Medals:* Emile Monnin Chamot, Ph.D., professor of chemistry, Cornell University; Richard T. Erban, consulting engineer, New York City; John S. Haug, consulting gas engineer, United Engineers and Constructors, Inc., Philadelphia; Harold Sinclair, director, Hydraulic Coupling and Engineering Company, Ltd., England; Herbert L. Whittemore, chief, Engineering Mechanics Section, National Bureau of Standards.

*The Henderson Medal:* Rupen Eksbergian, Ph.D., E. G. Budd Manufacturing Company, Philadelphia.

*The Levy Medal:* Inge Lyse, professor of engineering materials, Lehigh University.

*The Potts Medal:* John Clyde Hostetter, Sc.D., vice-president, Hartford Empire Company, Conn.

*The Cresson Medals:* Carl David Anderson, Ph.D., California Institute of Technology; William Bowie, Sc.D., LL.D., United States Coast and Geodetic Survey (retired); Jacques Edwin Brandenberger, Neuilly-sur-Seine, France; William Francis Giauque, Ph.D., University of

California; Ernest Orlando Lawrence, Ph.D., director, Radiation Laboratory, University of California.

An address will be presented on behalf of Dr. Milikan, who is unable to attend the ceremonies, by Dr. Carl D. Anderson, of the California Institute of Technology, on "Exploring the Stratosphere for New Electrical Effects." Dr. Debye's address on "Structural Electrolytic Solutions" will be presented by Dr. Charles P. Smyth, of Princeton University.

## SCIENTIFIC NOTES AND NEWS

DR. WILLIAM H. PARK, founder of the public health laboratories of New York City, received the George M. Kober Medal from the Association of American Physicians on May 5 at the closing session of its fifty-second annual convention at Atlantic City. It was announced that next year the medal will be awarded to Dr. Rufus Cole, director of the Hospital of the Rockefeller Institute, New York.

DR. JAMES F. NORRIS, professor of organic chemistry at the Massachusetts Institute of Technology, has been awarded the annual medal for notable service to science and chemistry of the American Institute of Chemists. The medal will be presented to Dr. Norris on May 15 at the annual dinner of the institute. The award was made in recognition of "outstanding service as a teacher and as an investigator in the field of organic chemistry."

THE Pennsylvania Society of New York has awarded its Medal for Distinguished Service to Dr. Victor G. Heiser, from 1914 to 1927 director for the Far East of the International Health Board of the Rockefeller Foundation, and from 1927 to 1934 associate director of the International Health Division of the foundation. The award was made in recognition of the medical research carried out by him under the auspices of the foundation.

At the annual dinner of the National Institute of Social Science, New York City, on May 11, one of the gold medals of the society was presented to Dr. James Rowland Angell, president of Yale University, "in recognition of services rendered in the interest of scholarship and education; because of distinction in psychology, and as a truly distinguished educator."

A DINNER in honor of Dr. William F. Durand, emeritus professor of engineering at Stanford University, was given on May 7 by alumni in San Francisco. Mr. Herbert Hoover was chairman of the committee arranging the dinner.

FIVE members of the National Association of Science Writers, all of whom have reported the meetings of the

American Association for the Advancement of Science for many years, shared the \$1,000 Pulitzer award for 1937. The award, "for the most distinguished example of a reporter's work," was given in recognition of the accomplishments in connection with the tercentenary celebration of Harvard University. The criteria of which the award is made are "strict accuracy, terseness, the preference being given to stories prepared under the pressure of edition time that redound to the credit of journalism." Those sharing the award are: Howard W. Blakeslee, Associated Press, *president*; William L. Laurence, *The New York Times*, *vice-president*; David Dietz, Scripps-Howard Newspapers, *past president*; Gobind Behari Lal, *Universal Service*, and John J. O'Neill, *The New York Herald-Tribune*.

A WHITE pine tree was planted at Warrensburg, N. Y., on the Charles Lathrop Pack Demonstration Forest on May 7, by the New York State College of Forestry at Syracuse, N. Y., to celebrate the eightieth birthday of Charles Lathrop Pack, president of the American Tree Association. This tree will be a companion to the George Washington tree planted in front of the rustic lodge along the main highway running north and south between Lake George and Montreal. It will be planted by Dean Samuel N. Spring, Professors Ralph T. King and Svend Heiberg, with the assistance of the director of the Pack Forest, Clifford H. Foster. Mr. Pack, the donor of several college forests, has given two forests to the New York State College, one of 1,000 acres on the shores of Cranberry Lake, and one of 2,250 acres, three miles north of Warrensburg.

THE Medal of the British Society of Chemical Industry, presented every alternate year "for conspicuous service to applied chemistry," has been awarded to Professor G. G. Henderson, regius professor of chemistry in the University of Glasgow. The medal was awarded in recognition of original research—mostly in the organic field, particularly the chemistry of terpenes—and of the supervision of the research work of students.



directed by M. P. LEBEAU, professor of pharmaceutical chemistry in the University of Paris, has been elected a member of the Academy of Sciences, Institute of France, to take the place of the late M. H. Le Chatelier.

Dr. HEINRICH WIELAND, professor of chemistry at Munich, has been elected a corresponding member of the Physico-Mathematical Section of the Prussian Academy of Science.

THE degree of doctor of laws will be conferred in June by the University of Glasgow on Dr. Jan Boeke, professor of histology and embryology at the University of Utrecht; on Dr. Max Planck, emeritus professor of theoretical physics at the University of Berlin; on Sir Albert Charles Seward, emeritus professor of botany at the University of Cambridge, recently master of Downing College, and on Sir Robert Blair, emeritus professor of pathology at the University of Glasgow.

Dr. EDWIN G. CONKLIN, of Princeton University, was elected president of Science Service, at its annual meeting on April 29. Dr. J. McKeen Cattell had made known his desire not to be reelected after nine years of the presidency, but continues as a member of the board of trustees, on which he has served continuously since Science Service was founded in 1921. The trustees and staff of Science Service joined in honoring Dr. Cattell at a dinner on April 28. Dr. W. H. Howell, of the Johns Hopkins University, was reelected vice-president and chairman of the executive committee, while Harry L. Smithton, of Scripps-Howard Newspapers, was reelected treasurer. Dean Carl W. Ackerman, of the Graduate School of Journalism of Columbia University, was added to the board of trustees.

At the recent meeting of the American Society of Biological Chemists at Memphis, Tenn., the following officers were elected: *President*, G. E. Cullen, University of Cincinnati; *Vice-president*, W. C. Rose, University of Illinois; *Secretary*, H. A. Mattill, University of Iowa, and *Treasurer*, A. B. Hastings, Harvard University. Additional members of the council are: B. Collip, H. B. Vickery and H. B. Lewis.

At the fourth annual meeting of the American Institute of Nutrition, held in Memphis on April 21, the following officers were elected: *President*, Mary Swartz Rose; *Vice-president*, E. V. McCollum; *Treasurer*, George R. Cowgill; *Secretary*, Icie G. Macy; *Counselors*, C. A. Elvehjem, L. A. Maynard and Paul E. Howe.

At the annual meeting of the Missouri Public Health Association, recently held in Springfield, the following officers were elected: *President*, Dr. Edwin H. Schorer, health director, Kansas City, Mo.; *President-elect*, Dr.

M. P. Moon, associate professor of bacteriology (medical) and preventive medicine, University of Missouri; *Secretary*, Dr. John W. Williams, assistant state health commissioner; *Treasurer*, L. E. Ordelheide, sanitary engineer, St. Louis County.

RETIREMENTS at the University of California at Berkeley are announced as follows: Dr. Henry R. Hatfield, professor of accounting on the Flood Foundation; Dr. W. L. Jepson, professor of botany; Dr. Derrick N. Lehmer, professor of mathematics; Dr. C. C. Plehn, Flood professor of finance; Dr. Charles A. Noble, professor of mathematics; Charles E. Rugh, professor of education, and Dr. Joseph N. LeConte, professor of mechanical engineering.

MEMBERS of the faculty of the University of Minnesota who will have reached the age of retirement—sixty-eight years—at the close of the present academic year include: Dr. J. B. Johnston, dean of the College of Science, Literature and Arts; William H. Kirchner, professor of drawing and descriptive geometry in the Institute of Technology; Professor Josephine E. Tilden, of the department of botany; Dr. Edgar D. Brown, associate professor of pharmacology in the Medical School; Professor Everett W. Olmsted, head of the department of Romance languages, and Miss Marion Weller, of the department of home economics.

Dr. KENNETH F. MAXCY, who recently retired as professor and head of the department of preventive medicine and public health of the School of Medicine of the University of Minnesota, has been appointed professor of bacteriology at the School of Hygiene and Public Health of the Johns Hopkins University, effective on July 1. He succeeds Dr. William W. Ford, who has held the position since 1920 and is retiring on account of the age limitation. Dr. Maxcy accepted the directorship of the International Health Division of the Rockefeller Foundation in January.

PROFESSOR LINUS PAULING has been appointed to succeed the late Professor Arthur A. Noyes as director of the Gates Chemical Laboratories of the California Institute of Technology.

Dr. EMMERICH VON HAAM, for the past six years assistant professor of pathology at the Louisiana State University, has been made chairman of the department of pathology of the College of Medicine of the Ohio State University. He will take up his new work on July 1. The department has been administered by Dr. Carl L. Spohr as acting chairman since the death of Dr. Ernest Scott in 1934.

At Columbia University, Dr. Sam F. Trelease has become Torrey professor of botany, and Dr. Edward Kasner, Adrain professor of mathematics, both by change of title. Dr. Jerome J. Morgan has been pro-

moted to a full professorship of chemical engineering, and Dr. Jan Schilt has become Rutherford professor of astronomy and director of the Rutherford Observatory.

DR. THEODORE GEORGE BENTLEY OSBORN has been appointed to the Sherardian chair of botany of the University of Oxford.

DR. RUDOLPH PEIERLS, at present assistant-in-research at the Mond Laboratory of the Royal Society at Cambridge, has been appointed to the newly established chair of applied mathematics at the University of Birmingham.

DR. ALBERT R. MANN, since 1931 provost of Cornell University, has been elected vice-president and director for southern education of the General Education Board. He had been dean of the New York State College of Agriculture from 1917 to 1931 and of the State College of Home Economics since its establishment in 1925.

DR. JAMES ROWLAND ANGELL, retiring president of Yale University; Dr. Livingston Farrand, retiring president of Cornell University, and Lewis W. Douglas, formerly director of the United States Budget, were elected members of the board of trustees of the American Museum of Natural History at a meeting of the trustees held on May 3.

BANCROFT GHERARDI, vice-president and chief engineer of the American Telephone and Telegraph Company, has been elected a trustee of Cornell University, to fill the unexpired term of the late Robert H. Treman.

M. A. CARRIKER, JR., of the department of ornithology of the Academy of Natural Sciences of Philadelphia, and Gordon Howes, of Toms River, N. J., sailed on April 24 for South America to continue their study of bird migration in Bolivia.

DR. HERBERT S. GASSER, director of the Rockefeller Institute for Medical Research, gave on May 12 a lecture entitled "Nerve Fibers" before the Yale Medical Society.

DR. A. J. CARLSON, of the University of Chicago, spoke on "Science and the Common Life" at the annual public meeting of Phi Beta Kappa on May 5 at Newcomb College, Tulane University.

THE fourth general assembly of the International Union for the Scientific Investigation of Population Problems will meet in Paris on July 28 in connection with the International Population Congress, organized by the French National Committee, which takes place from July 29 to August 1. The Population Association of America, through its Research Committee, which is also the American National Committee of the International Union, is sending a number of delegates to attend the assembly and the congress. The delegates, most of whom will present papers, are as follows: O. E. Baker, Joseph V. De Porte, Harold F. Dorn, Louis I. Dublin, H. P. Fairechild, Carter Goodrich, Norman E. Himes, Clyde V. Kiser, C. E. Lively, Frank W. Lorimer, Alfred J. Lotka, Frank W. Notestein, Frederick Osborn, Raymond Pearl, Frederick P. Stephan, S. A. Stouffer, Warren S. Thompson, Lewis E. Truesdale, P. K. Whelpton, Robert M. Woodbury, and T. J. Woofter, Jr. Adequate representation of American scholars on this occasion has been made possible by a grant of \$2,500 from the Milbank Memorial Fund and a grant of equal amount from the Carnegie Corporation of New York, towards the expenses of the delegation.

THE twenty-third annual meeting of the American Association of Cereal Chemists will be held under the presidency of H. D. Liggitt, Jr., from May 24 to 28 at the Nicollet Hotel, Minneapolis. Among those appearing on the program are: Dr. Alonzo E. Taylor, director of the Food Research Institute of Stanford University and chairman of the research committee of General Mills, Inc., Minneapolis; Dr. D. Brees Jones, of the U. S. Department of Agriculture; Dr. C. W. Brabender, of Germany, and Dr. D. Jordan Lloyd, of the British Leather Manufacturers Association.

## DISCUSSION

### THE INTERNATIONAL WHO'S WHO

THE second edition of the international "Who's Who" (London, 1937) is a valuable work of reference containing brief biographical sketches of about 19,000 persons considered by its editors to be of "international prominence." The general make-up follows the lines familiar in the American "Who's Who." The numerical representation of the hundred countries included ranges from 3,150 for Great Britain and 2,650 for the United States down to single units for several

of the small countries. Women are represented by 1.6 per cent. of the total number of names, while the percentage for Great Britain is 2.8 and for the United States is 3.6.

The distribution among the principal countries is as follows:

	Per cent.		Per cent.
Great Britain .....	16.7	Czechoslovakia .....	1.7
United States .....	14.0	Austria .....	1.6
France .....	9.1	Switzerland .....	1.6



Germany .....	8.2	Yugoslavia .....	1.6
Italy .....	3.7	Norway .....	1.5
Sweden .....	3.3	Soviet Republic .....	1.5
Japan .....	2.6	South Africa .....	1.4
Denmark .....	2.3	Belgium .....	1.3
Hungary .....	2.2	India .....	1.3
Canada .....	2.2	Roumania .....	1.2
Netherlands .....	2.1	Spain .....	1.2
Australia .....	2.1	China .....	1.1
Poland .....	2.1	Finland .....	1.1

Nebraska .....	30	Amherst .....	16
Naval Academy .....	29	Georgetown .....	16
Brown .....	28	N. Y. Law School .....	16
Minnesota .....	28	Ohio Wesleyan .....	16
Northwestern .....	26	Washington .....	16
Williams .....	26	Vanderbilt .....	15
Iowa .....	24	Wesleyan .....	15
Military Academy .....	23	Cincinnati .....	14
Ohio .....	22	Pittsburgh .....	14
Boston .....	21	Clark .....	13
Missouri .....	21	Hamilton .....	12
Texas .....	21	Colorado .....	11
Dartmouth .....	19	Tulane .....	11
Kansas .....	19	DePauw .....	10
City College of N. Y. .....	18	Maryland .....	10
Oberlin .....	18	Washington and Lee .....	10
N. Carolina .....	17		

The distribution among the more important occupations for the British and U. S. Americans is as follows:

BRITISH		U. S. AMERICANS	
	Per cent.		Per cent.
Politics .....	29	Science .....	23
Business .....	13	Writing .....	17
Writing .....	12	Law .....	10
Science .....	11	Business .....	10
Art .....	6	Politics .....	7
Law .....	5	Finance .....	6
Medicine .....	4	Art .....	6
Theology .....	3	Education .....	5
Finance .....	3	Engineering .....	4
Diplomacy .....	3	Medicine .....	3
Military .....	3	Diplomacy .....	3
Education .....	2	Theology .....	2
Engineering .....	2	Military .....	1
Trade Unions .....	2	Trade Unions .....	0.3

There are 300 other institutions represented by less than ten names each.

The distribution among the principal sciences for the British and Americans is as follows:

BRITISH		AMERICAN	
(Total of 336 names)		(Total of 605 names)	
	Per cent.		Per cent.
Chemistry .....	14	Economics .....	16
Economics .....	12	Chemistry .....	8
Physics .....	8	Physics .....	8
Philosophy .....	8	Astronomy .....	7
Mathematics .....	7	Geology .....	7
Archeology .....	6	Philology .....	6
Social Science .....	5	Social Science .....	5
Physiology .....	4	Biology .....	5
Philology .....	4	Botany .....	5
Astronomy .....	4	Zoology .....	4
Geology .....	4	Mathematics .....	4
Geography .....	3	Psychology .....	4
Ornithology .....	3	Political Science .....	3
Anthropology .....	3	Philosophy .....	3
Botany .....	3	Archeology .....	2
Psychology .....	3	Anthropology .....	2
Zoology .....	3	Physiology .....	2
Mineralogy .....	2	Meteorology .....	2

There is some overlapping, as, for example, politics and law. Administrative officials are included under politics. For the Americans, science includes economics with 99 names, chemistry 50, physics 46, astronomy 41, geology 40, philology 35, social science 32, biology 30, botany 30, zoology 26, mathematics 22, psychology 22, and others.

Of the U. S. Americans who attended more than one college or university, 610 attended two, 200 attended three and 110 attended four or more institutions of learning. On the other hand, there are 420 who do not list any college education. There are 1,170 who have the doctor's, 150 the master's and 400 the bachelor's degree. Americans attending foreign institutions of learning numbered 610, and 240 foreigners, mostly Chinese and Canadians, attending American institutions. The number of persons attending the various American colleges and universities is as follows:

Harvard .....	437	Wisconsin .....	83
Columbia .....	290	California .....	55
Yale .....	222	Mass. Inst. Tech. ....	52
Chicago .....	157	George Washington .....	46
Princeton .....	114	N. Y. Univ. ....	43
Johns Hopkins .....	113	Virginia .....	41
Cornell .....	96	Illinois .....	35
Michigan .....	85	Indiana .....	35
Pennsylvania .....	85	Stanford .....	33

FRANK B. LITTELL  
WASHINGTON, D. C.

### "HOMING" OF PACIFIC SALMON

IN a recent communication<sup>1</sup> Professor A. G. Huntsman questions the evidence for the "homing" of salmon, i.e., the return to the "natal river from a distant place in the sea." While I can not speak from experience in respect of the Atlantic salmon I feel very confident that the Pacific salmon of the genus *Oncorhynchus* do return to their home streams from long distances at sea and that comparatively few are "lost" and enter streams other than those whence they came.

If we accept as absolutely essential to satisfactory

<sup>1</sup> SCIENCE, 85: 313-314, 1937.

proof the criteria set up by Professor Huntsman it must be admitted that complete evidence is lacking. He states, in effect, that it is necessary to prove "for the individual fish" not only that it has returned to its home stream, but that it has been far from the "zone of river influence" of that stream. I should like to add that it would also be necessary for completely rigid proof that the evidence be quantitatively adequate to satisfy the requirements of statistical significance. So far as I can see such rigid observational proof could only be provided by marking young fish in their "natal river," recapturing them in the sea at a point sufficiently distant to satisfy every one that the fish was beyond the "zone of river influence," tagging or marking them at that point and again releasing and, finally, to recapture them a second time in their "natal river." Needless to say, it will be some time before much such proof will be accumulated.

I think, however, that the logic of the situation is such that we need not demand such practically impossible evidence before we can say with considerable assurance that salmon do return predominantly to their native streams from whatever distance they may go in the sea. There is ample evidence, both observational and statistical, of intraspecific racial segregation in the Pacific salmon.<sup>2</sup> The development and maintenance of such races could not take place if there were much intermingling of the population groups on the spawning grounds. That there is some such intermingling no one would deny; but it can not be extensive in most cases and is probably confined chiefly to races inhabiting streams not widely separated. If there is not extensive intermingling of races on the spawning grounds can we say, then, that the individuals belonging to these races do not range at sea beyond the limits of "river influence"?

I do not think so. We know that very large numbers of fish do enter streams hundreds of miles from the point of tagging<sup>3</sup> and under conditions that warrant the assumption that the fish are well beyond the range of "river influence"—so far, at least, as has yet been determined by hydrographic studies. But there is no evidence of such wholesale admixture of races as would result if these large numbers of salmon were indeed "lost" so that they would enter any stream within the influence of which they happened to wander. If they were so lost it would seem impossible that the fish spawning in different streams could be so racially dis-

tinged as they often are even in nearby tributaries of a single river system. The simplest theory that will adequately explain all these facts is that the salmon do return predominantly to their home streams.

Perhaps one of the difficulties is due to the use of the word "instinct" with reference to "homing" and "migration." "Instinct" need not imply, although it usually does, a reaction involving factors that are not susceptible to scientific study and analysis; it need only mean that the factors have, as yet, not been determined. It can not be doubted that some kind or kinds of gradients serve to guide the salmon, as with all other migrating animals, on their journeys. These gradients may be those more obvious ones associated with "river influence" or some as yet unrecognized gradients in the ocean.

Important practical problems in the conservation of the Pacific salmon are involved because laws and regulations have been based upon the theory that the salmon do return to their home streams for spawning and the corollary that the populations in the different streams are independent and self-perpetuating. It is to be hoped that the doubt cast by Professor Huntsman upon the validity of this theory on account of the lack of complete observational proof will not affect the present general acceptance of the theory and of the obvious requirements of conservation that it demands.

WILLIS H. RICH

STANFORD UNIVERSITY

#### GLASS GLOBES ON THE PACIFIC

THE glass globes mentioned in *SCIENCE* for February 12, 1937, p. 179, evidently float northeastward, as well as across the Pacific. We of last summer's Hrdlička expedition to the Aleutians found eight or nine of them on the northwestern shore of Kiska Island, latitude fifty-two degrees; between 177 and 178 longitude, east.

SYDNEY CONNOR

JUNIOR SCHOOL BUILDING

GIRARD COLLEGE, PHILADELPHIA

#### LINES OF INHERITANCE IN FAMILIES OF "BLEEDERS" AS NARRATED IN 1834

IN view of the date of publication an article from which I quote below may be of interest to students of Mendelism. It is entitled "Extraordinary Bleeders." It was published in 1834 in a "History of Ipswich, Essex and Hamilton, Mass.," by Joseph B. Felt.

There are four families in this town (Hamilton) called bleeders. Three of these are immediately and the other medially related. The number of individuals so denominated is five. They are thus named from an unusual propensity in their arteries. . . . Some of their predecessors have come to their end by wounds which are not

<sup>2</sup> Numerous publications during the years 1912 to 1933 by C. H. Gilbert, W. A. Clemens, J. O. Snyder, W. H. Rich and others in *Bull. U. S. Bur. Fish., Reports Commr. Fish. for Brit. Columbia and Calif. Fish and Game and Fish Bulls.*

<sup>3</sup> C. H. Gilbert and W. H. Rich, *Bull. U. S. Bur. Fish.*, 42: 27-75, 1925; W. A. Clemens, *Prog. Repts. Pac. Biol. Sta., Biol. Bd. Can.*, 4: 11-13, 1929; A. L. Pritchard, *ibid.*, 8: 15-20, 1931.



considered by any means dangerous for people in general. This hemorrhage first appeared in the Appleton family, who brought it with them from England. *None but males are bleeders, whose immediate children are not so, and whose daughters, only, have sons thus disposed.* As to the precise proportion of these, who may resemble their grand-

fathers, in bleeding of this kind, past observation furnishes no data.

The italics are mine.

GEORGE E. LADD

CHEVY CHASE, MD.

## QUOTATIONS

### THE MELLON INSTITUTE

THE formal dedication of the Mellon Institute's huge new building, a temple of science in outward appearance and inward spirit, is an event of national magnitude. And properly so when it is recalled that the institute has served some 4,000 firms, developed 650 processes and products and created ten new industries since Andrew W. Mellon and the late Richard B. Mellon founded it in 1911. The new structure is a monument not only to the generosity and far-sightedness of the two brothers who made it possible but of the late Professor Robert Kennedy Duncan, who conceived the industrial research fellowship system which has been such a brilliant success.

When the small manufacturer hears of the millions spent annually for research by great companies he wonders how long he will last—wonders how he, without even a testing laboratory, can compete with trained crews of Ph.D.'s hired to improve yarns, telephones, lamps, radio sets, tins for foods and foods themselves. The Mellon Institute is his salvation. Here for a few thousand dollars science doffs its coat, rolls up its sleeves, solves his problem, creates values for him, and what is more important, opens his eyes to the rich return that research pays.

Though this social aspect of the work done in accordance with Robert Kennedy Duncan's policy needs

to be stressed, it would be wrong to regard the Mellon Institute merely as an industrial life preserver. As a non-profit-making enterprise it plows back for the public good the excess moneys that may not remain in its bank account. So we find it concerning itself with more than skinless frankfurters, soapless soaps, flaked coffee, shoes that can be polished merely by rubbing a cloth over them, razor blades, unbreakable dishes of new plastic compounds. It draws on its own scientific and financial resources to solve the problem of smoke and dust, to arrive at better ways of diagnosing tuberculosis, to study methods of treating pneumonia, to illuminate the dark subject of dental decay. Nor is it unmindful of its obligation to advance science as such. Its work in theoretical chemistry and biology, for which new facilities are provided, promises to be even more distinguished in the future. Under Drs. Robert Kennedy Duncan and Raymond Bacon, and latterly under Edward R. Weidlein, the institute has become not only the technical first-aid of big and little business, but a training school for future laboratory directors, an experiment station for the advancement of science, a clearing-house of information for the public. As such it deserves not only the good wishes and congratulations of the manufacturers whom it has served, but of a wider public that may not be fully aware of its high place in industry and science.—*The New York Times*.

## SCIENTIFIC BOOKS

### THEORY OF SOUND

*Vibration and Sound.* By PHILIP M. MORSE. New York: McGraw-Hill Book Co., 1936, pp. xv + 351, \$4.00.

THE outstanding advances in acoustics during the last two decades have been made chiefly in physiology and in engineering rather than in the physics of sound. Most of the recently published books on the subject have reflected this trend, but this one by Professor Morse is written almost entirely from the point of view of the classical physicist. It emphasizes the physical principles underlying all engineering applications.

I have used the term "classical" advisedly, as from a casual reading of the announcement of the book one might get the quite erroneous impression that at least certain phases of the subject are treated by quantum

mechanics. While it is true that some acoustical phenomena, such as the abnormal attenuation of sound in gases discovered by Knudsen, can not be satisfactorily explained without resort to quantum physics, these particular matters are not discussed.

A study of this book does, however, reveal that there is an interesting parallel in the relationship between electrical engineering and acoustics, on the one hand, and wave mechanics and acoustics, on the other hand. To the beginning student the general principles of electrical circuit phenomena are most easily explained by means of acoustical analogies, but in the electrical engineering art there have been developed theories and formulae covering many combinations of circuit elements with which the practicing engineer has become much more familiar than with the theories relating to

corresponding mechanical and acoustical systems. Because of this familiarity, it has become the custom to describe various acoustical phenomena in the language of the electrical engineer by reference to corresponding electrical circuits. In presenting the principles of wave mechanics, Schroedinger and subsequent expositors of the subject made use of acoustical analogies, showing particularly the similarity in the problems of finding the allowed energy levels in atomic physics and the normal modes of vibration of mechanical and acoustical systems. Because of the extraordinary interest in atomic physics in recent years, the former class of problems has become more familiar to the theoretical physicist than the latter. In this book, therefore, some of the mathematical techniques used in wave mechanics and particularly the idioms which there have become familiar are applied to problems in acoustics.

The book deals most particularly with those parts of acoustics to which the mathematical methods used in wave mechanics are especially applicable, that is, those in which normal modes of vibration are determined from a differential wave equation and the boundary conditions and in which the resulting motion under a given force is determined by expansion of the force in a series of terms characterizing the normal modes of motion. The extent to which this method of treatment dominates the discussion throughout the book is indicated by the fact that nothing or little is said about velocity potential, the dynamical equations of Lagrange or the principle of reciprocity. The author devotes considerable space at the beginning of the book to the vibrating string, as this is admirably adapted for priming the student in the mathematical methods used in most of the succeeding chapters, which deal with bars, membranes, plates, radiation, propagation and scattering of sound, speech and hearing, and the acoustics of rooms.

The engineer may not find this book entirely convenient if he is looking for information of the kind which is customarily given in engineering handbooks. Some of the notation, which is often at variance with that adopted by the American Standards Association, may be unfamiliar to him, *e.g.*,  $\nu$  is used instead of  $f$  for frequency and a clockwise instead of the conven-

tional counter-clockwise rotation of the positive vector is adopted. On the other hand, the student who wishes to become thoroughly grounded in certain methods of the theoretical physicist as applied to acoustical problems and at the same time to obtain a comprehensive picture of the physical relationships involved, will here find an excellent introduction. Although the discussion throughout the book is based on well-established principles, the presentation is refreshingly original as well as clear. A set of well-chosen, illustrative problems is given at the end of each chapter.

It has long been customary to consider the problem in the acoustics of rooms from the standpoint of wave propagation and the mean free path of the wave. This method has been fruitful in dealing with practical problems. More recently a number of investigators have studied the subject analytically by the more conventional methods of mathematical physics whereby the normal modes of vibration together with their periods and rates of decay are determined from the field equation and the boundary conditions. This is the method of treatment adopted in this book. Although it may not as yet have been of great direct help in the acoustical design of rooms because of the difficulty of obtaining even an approximate solution of the equations in practical cases, it is extremely valuable in that it affords a clear physical picture of the nature of the acoustical phenomena in rooms. The discussion by Professor Morse is, I think, more illuminating than anything presented heretofore from this point of view.

The particular forms of the apparatus and instruments chosen as examples for the application of the mathematical methods are not of a kind that have come into commercial use, nor perhaps of a kind that any one should want to build for purposes of study. They apparently have been idealized to illustrate more effectively the points the author wishes to emphasize. This procedure is in line with the whole plan of the book, which is to discuss and bring out those principles that are physically fundamental to the science rather than to give a description of things which may be here to-day and gone to-morrow.

E. C. WENTE

## SPECIAL ARTICLES

### FUNDAMENTAL THEOREMS OF TRIHORNOMETRY

(1) A *horn angle* is the figure formed by two curves having a common tangent at a common point. Only the case of first order contact is considered here. The unique conformal invariant of a horn angle I have shown to be

$$M_{12} = \frac{(\gamma_2 - \gamma_1)^2}{\frac{d\gamma_2}{ds_2} \frac{d\gamma_1}{ds_1}}$$

where  $\gamma$  represents curvature and  $s$  are length. This combination of the two curvatures and the two rates of curvature is therefore called the *natural measure* of the horn angle. It is a real abstract number.



Since only first order contact is allowed, the measure can not be zero, but can be infinity. If  $M$  is infinite, the horn angle can be reduced conformally to the circular (or Euclidean) case—a circle and a tangent line. If  $M$  is finite, the horn angle can be reduced to the parabolic (or Apollonian) case—a parabola and a tangent to it at a point that is not its vertex.

For convenience, the curvatures are represented by  $x$  and the rates of curvature by  $y$ . Then,  $M_{12} = (x_2 - x_1)^2 / (y_2 - y_1)$ . An auxiliary plane in which  $x$  and  $y$  are represented as cartesian coordinates is introduced. The horn angle is represented by two points  $(x_1, y_1)$ ,  $(x_2, y_2)$ , and  $M_{12}$  is their distance in the new metric. Obviously  $M_{21} = -M_{12}$ .

(2) A trihorn is formed when three curves have a common tangent at their common point (but do not have higher contact at this point). A trihorn has six measures:  $M_{12}$ ,  $M_{21}$ ,  $M_{23}$ ,  $M_{32}$ ,  $M_{31}$ ,  $M_{13}$ . These are identically connected by the following relations:

$$M_{21} = -M_{12}, M_{32} = -M_{23}, M_{13} = -M_{31}.$$

We select  $M_{12}$ ,  $M_{23}$ ,  $M_{31}$  as the three principal measures of the three horns of the trihorn.

Besides, a trihorn has six new angles:  $\alpha_{12}$ ,  $\alpha_{21}$ ,  $\alpha_{23}$ ,  $\alpha_{32}$ ,  $\alpha_{31}$ ,  $\alpha_{13}$  which are conformally invariant. Each angle measures the angle between two horns and may be called a dihorn angle. The angle  $\alpha_{12}$  is defined in the auxiliary plane as follows:

$$\alpha_{12} = \alpha_{3, 12} = \alpha_{31, 32} = \frac{(y_2 - y_3) / (x_2 - x_3)}{(y_1 - y_3) / (x_1 - x_3)}.$$

Therefore,

$$\alpha_{21} = \frac{1}{\alpha_{12}}, \alpha_{32} = \frac{1}{\alpha_{23}}, \alpha_{13} = \frac{1}{\alpha_{31}}.$$

We select  $\alpha_{12}$ ,  $\alpha_{23}$ ,  $\alpha_{31}$  as the three principal angles of the trihorn. In the auxiliary plane, the trihorn is represented by a (rectilinear) triangle; the  $M$ 's are the sides of the triangle, and the  $\alpha$ 's are the angles.

We now state the following theorems on trihornometry; some are analogous to theorems in ordinary trigonometry, and some are strikingly different.

I. A necessary condition that three numbers be the measures of the sides of a trihorn is

$$M_{12} M_{23} M_{31} (M_{12} + M_{23} + M_{31}) \leq 0$$

If  $M_{12}$  and  $M_{23}$  are positive, so also is  $M_{31}$ , and we have  $M_{12} + M_{23} \geq M_{31}$ . In this sense the sum of the parts is usually greater than the whole, but may be equal to the whole. In the exceptional case of equality we call the trihorn *wide-open*.

II. The absolute values of the three measures are equal if and only if all are infinite. If two of the measures are infinite, the third measure is infinite; the trihorn is then said to be completely circular or Euclidean.

Except for these peculiar cases, and the case where the  $M$ 's are equal in absolute value, the condition

$$M_{12} M_{23} M_{31} (M_{12} + M_{23} + M_{31}) \leq 0$$

is sufficient for three numbers to be the measures of a trihorn. If  $M_{12} + M_{23} + M_{31} = 0$  the trihorn is *wide-open*. The three points in the auxiliary plane are then collinear.

III. The  $\alpha$  angles of a trihorn obey the relation  $\alpha_{12} \alpha_{23} \alpha_{31} = 1$ . This a fundamental *equality*, instead of *inequality*, as for the sides.

IV. If one and only one side of a trihorn is infinite, one of the adjacent angles of the trihorn is zero, another is infinite, and the third angle (opposite the infinite side) is finite and non-zero. The third angle has two possible values if the sides are given. (Such a trihorn is partially circular.)

V. If one of the angles of a trihorn is infinite (then, it follows, one of the sides is infinite), another angle is zero and the third is finite and non-zero.

VI. If the three measures of a trihorn are infinite (completely circular) the angles are all indeterminate.

VII. If one of the angles of a trihorn is indeterminate, then all the angles are indeterminate and the three measures are infinite.

VIII. If a trihorn is wide-open and not circular, the three angles are unity.

IX. If one of the angles is unity, all the angles are unity and the trihorn is wide-open.

X. Except for unit, zero, infinite and indeterminate values, the equality  $\alpha_{12} \alpha_{23} \alpha_{31} = 1$  is a sufficient condition for three numbers to be the angles of a trihorn.

XI. If the three sides of a trihorn are given, two values of the angles are determined; that is two distinct (non-congruent) triangles exist. The trihorns are conformally distinct.

XII. If the three angles of a trihorn are given, the ratios of the three sides are uniquely determined. If any three parts, except the three angles, are given, all the parts are determined (with one or two solutions). (The detailed formulas, all algebraic, will be given elsewhere).

XIII. Neither equilateral nor equiangular triangles exist.

XIV. If two sides of a triangle are equal, the opposite angles are never equal.

XV. A triangle can have two right angles, but not three.

XVI. In any isosceles triangle, the sum of the base angles is unity.

XVII. A *right angle* has the value  $\alpha = \frac{1}{2}$ , and an *anti-right angle*, the value  $\alpha = 2$ . The minimum distance is given by the former value. The perpendicular and the anti-perpendicular distances between two parallel lines are in the ratio of  $-8:1$ .

XVIII. The medians of a triangle (mid-points correspond to the bisectors of the horns of the trihorn) are concurrent; but the altitudes are not concurrent.

XIX. The congruence group in the new metric is  $X = mx + h$ ,  $Y = m^2y + k$ .

(4) In conclusion, I remark again that only horn angles of first order contact are allowed in the preceding discussion. If higher contacts are permitted, the theory becomes much more complicated (since each order requires a new theory of measure), and the complete conformal geometry of horn angles becomes *non-Archimedean*. The fact that angles of contact of different orders are not metrically comparable was first noted by Newton in the Principia.

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### UPWARD TRANSPORT OF MINERALS THROUGH THE PHLOEM OF STEMS

THE general opinion among botanists is that the mineral elements absorbed by the roots are transported upwards in the xylem with the water. Curtis<sup>1</sup> as a result of his numerous investigations has, however, suggested that at least some of the soil solutes ascend in the phloem. Mason and Phillis<sup>2</sup> dispose of the matter of solute conduction by the statement: "To sum up, ringing experiments have shown that soil solutes ascend the stem in the wood, but they have not demonstrated that they (soil solutes) may not also ascend in the phloem. It must be admitted, however, that the evidence available renders it very unlikely that they normally do so."

With a new tool available, namely, strongly radioactive elements, we have undertaken to clarify this issue. The installation of the new cyclotron equipment in the physics laboratories at the University of Michigan has made available fair quantities of strongly radioactive material. Phosphorus was chosen because it is an important element in every plant and because its half life is fifteen days, a period long enough to allow one to conduct several experiments with the same preparation. Red phosphorus was activated and then made into  $\text{KH}_2\text{PO}_4$ . This salt was made up into a 0.5 per cent. aqueous solution with a pH of 5 to 6. Rooted cuttings of geranium, *Sedum praealtum* and *Bryophyllum calycinum* have been used as plant material. These plants were chosen because the bark separates readily from the wood. The presence of the radioactive phosphorus in the plant was detected by means of an electroscope.

<sup>1</sup> O. F. Curtis, "The Translocation of Solutes in Plants." McGraw-Hill, 1935.

<sup>2</sup> T. G. Mason and E. Phillis, "The Migration of Solutes." *Bot. Rev.*, 3: 47-71, 1937.

As more details will later be published elsewhere only a few experiments will be cited here. With *Bryophyllum* several experiments were performed in which part of the bark with several leaves was completely separated from the wood except at the base and at this point the remainder of the plant was cut off. This left the plant with only a few leaves attached to the bark, which was connected with the roots through a portion of the unutilized stem. In one of these experiments the piece of bark was 22 cm long and had four leaves attached to it.

The roots of this plant were kept in the active phosphorus solution for about 40 hours. At the end of this period the leaves were still quite turgid. The bark was cut up into pieces 2 cm long and the activity determined. Table I gives the results for this experiment. The electroscope discharged itself in 40 minutes, so that any time less than 40 minutes denotes active phosphorus in the plant material.

TABLE I  
TIME REQUIRED TO DISCHARGE THE ELECTROSCOPE WITH  
CM-LONG PIECES OF BRYOPHYLLUM BARK

Distance above solution, cm	Time in minutes
3	13.0
7	16.0
11	19.25
15	22.5
17	25.0
19	30.0
23	38.0

This shows that even in the last section, which was 23 cm above the solution, there was some radioactive phosphorus present. In this experiment the leaves were not tested, but in others where tests were made active phosphorus was found to be present in them also.

In another group of experiments with *Bryophyllum* a complete section of the xylem, about 2 cm long, was removed from the stem, leaving the leaves connected with the roots only through the bark, which was left complete. In one of these experiments a well-rooted plant remained in an active phosphorus solution for 17 hours. Table II gives the results.

TABLE II  
TIME REQUIRED TO DISCHARGE THE ELECTROSCOPE WITH  
CM-LONG PIECES OF BRYOPHYLLUM STEM  
(SECTION OF WOOD REMOVED)

Distance above solution, cm	Bark	Xylem underneath bark
6	8.0 min.	20.0 min.
8	14.0 "	Wood removed
10	25.0 "	35.0 min.
13	32.8 "	39.5 "

There is evidence here that phosphorus was conducted through the phloem of the *Bryophyllum* stem.



and that some of this diffused into the xylem above the cut. A considerable quantity of the active element must be present before detection is possible by the electroscope.

To determine what may be the amount of active phosphorus in a plant with intact xylem as compared with one that has the xylem removed, experiments were performed with *Sedum praealtum*. The wood was removed from one plant, as in the *Bryophyllum*, and another similar plant with xylem intact was selected as control. The two plants were placed in the same solution and in one experiment kept there for 40 hours. They were both cut up at the same time, sections taken at the same levels and the quantity of active phosphorus determined alternately. Table III gives the results.

TABLE III

TIME REQUIRED TO DISCHARGE THE ELECTROSCOPE BY 2 CM-LONG PIECES OF *SEDUM PRAEALTUM* STEM

Distance above solution, cm	Phloem		Wood and pith	
	exp. plant	control	exp. plant	control
3	19.0 min.	15.5 min.	26.0 min.	19.0 min.
7	21.0 "	17.25 "	wood removed	
11	26.75 "	20.25 "	32.0 min.	24.25 "
15	30.0 "	26.5 "	35.5 "	29.0 "
19	38.0 "	32.5 "	39.0 "	37.75 "

The difference in quantity of active phosphorus, level for level, between the two plants is remarkably small.

Experiments with well-rooted geranium cuttings have also been performed. The results are essentially the same as for *Sedum*.

These experiments show beyond a doubt that the radioactive phosphorus, in form of phosphate, is transported up the stem of a plant through the phloem.

The writers take this opportunity to express their thanks to Professor J. M. Cork, of the Physics Department, for his kindness in supplying them with the radioactive material, and also to Miss Alice Huse for her help with some of the preliminary experiments.

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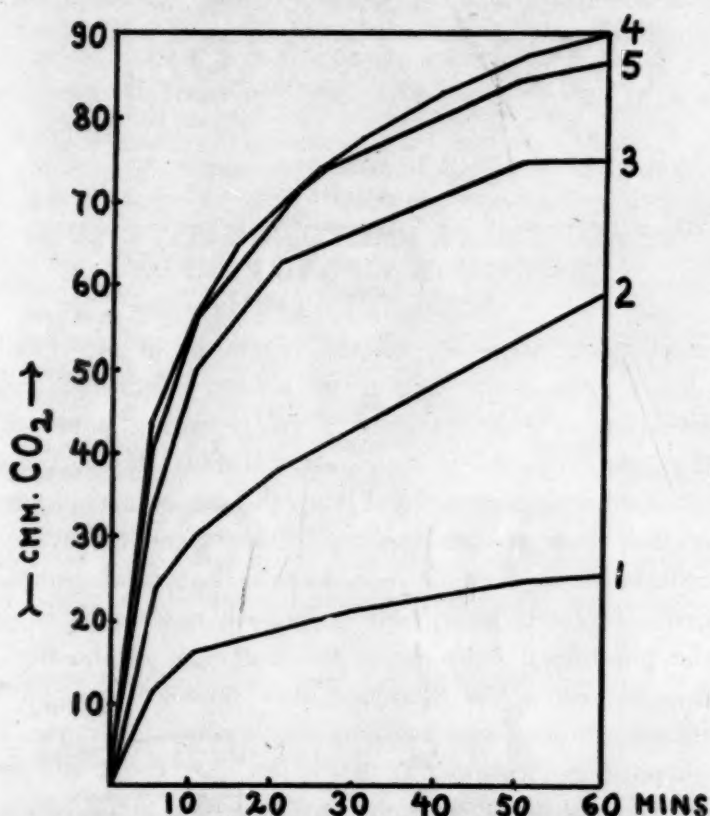
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# SYNTHESIS OF CO-CARBOXYLASE FROM VITAMIN B<sub>1</sub>

If synthetic, crystalline vitamin B<sub>1</sub> is treated in the cold with phosphorus oxychloride in a molecular ratio of at least 1:2, a compound is formed exhibiting the properties of co-carboxylase.

The activity of the synthetic co-enzyme of carboxylase is tested in a system containing bottom yeast freed from natural co-carboxylase by extensive wash-

ing, pyruvic acid as the substrate, and magnesium as activator. The carbon dioxide formed by decarboxylation of the substrate, as determined in Warburg manometers, serves as the measure of activity. Up to the present the yield of synthetic co-carboxylase, as judged from the comparison with boiled yeast juice, has not exceeded 1.5 per cent. of the theory. The same results have been obtained using crystalline, synthetic vitamin B<sub>1</sub> preparations from two different sources,<sup>1</sup> one prepared by the synthesis of Williams and Cline<sup>2</sup> and the other by that of Andersag and Westphal.<sup>3</sup> A typical experiment is shown in the figure.



The main room of the Warburg vessels (total volume about 17 cc) contained 1 cc of washed dry yeast (*cf.* Lohmann and Schuster<sup>4</sup>), corresponding to 100 mg dry weight, varying amounts of synthetic co-carboxylase or boiled yeast juice, and 0.1 M. phosphate buffer, pH 6.2, to make a volume of 3 cc. After attainment of equilibrium there were added from the side bulbs of the vessels 0.3 cc of sodium pyruvate solution, pH 6.2, equivalent to 5 mg pyruvic acid, containing 0.1 mg magnesium as MgCl<sub>2</sub>. In addition to the foregoing, vessel No. 2 contained 0.2 cc of boiled yeast juice, corresponding to 20 mg of bottom yeast, vessel No. 3 contained 0.3 cc, vessels No. 4 0.9 cc, and vessel No. 5 1.8 cc of the synthetic co-carboxylase preparation No. II (1 cc equivalent to 2.2 mg vitamin B<sub>1</sub> hydrochloride). Vessel No. 1, containing only yeast suspension and buffer in the main room, served as the control. Atmosphere: Air; temperature 28°.

<sup>1</sup> The authors are indebted to Merck and Company and to the Winthrop Chemical Company for the supply of synthetic vitamin B<sub>1</sub>.

<sup>2</sup> R. R. Williams and J. K. Cline, *Jour. Am. Chem. Soc.*, 58: 1504, 1936.

<sup>3</sup> Andersag and Westphal, cited by R. Grewe, *Zeits. physiol. Chem.*, 242: 89, 1936.

Lohmann and Schuster<sup>4</sup> report that natural co-carboxylase, isolated in highly purified form, from bottom yeast, represents a diphosphoric ester of vitamin B<sub>1</sub>. The thiochrome pigment prepared from co-carboxylase differs from that obtained from vitamin B<sub>1</sub> by its phosphorus content. Cataphoretic experiments performed on the thiochrome derived from our synthetic product indicate that ester formation with phosphoric acid has occurred. The present experiments thus offer additional proof for the validity of the results of Lohmann and Schuster.

Attempts to effect a transformation of vitamin B<sub>1</sub> into co-carboxylase by tissue extracts (liver, brain, intestine) have as yet not been successful.

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#### AN ACCESSORY PHOTSENSITIVE SUBSTANCE IN VISUAL PURPLE REGENERATION

KÜHNE'S discovery of the regeneration of visual purple in solution<sup>1</sup> has recently been confirmed and investigated quantitatively.<sup>2</sup> In repeating some of the measurements it was observed that in solutions bleached with a photoflood lamp the subsequent regeneration was greater than in those bleached by an ordinary 100-watt lamp, although the visual purple had completely disappeared in both cases. Because the photoflood lamp emits much energy in the blue, this suggested the existence of a blue-sensitive substance whose decomposition was essential for visual purple regeneration. If this is the case, visual purple solutions bleached by violet and blue light should show much more regeneration than solutions bleached by green, yellow and orange light. This turns out to be true, and an experiment illustrating it will now be described.

Two mutually exclusive parts of the spectrum were secured by passing the light from a heat-screened photoflood lamp on 110 volts either through a yellow filter (Corning No. 350) or through a blue one (Corning "lantern blue" No. 554). Tests showed that these two lights were almost equally effective in bleaching visual purple. A freshly prepared visual purple solution buffered at pH 7.7 was divided into two parts. One was illuminated with the blue light 10 cm away for 30 minutes, which was three times longer than necessary to bleach the visual purple completely. Its photometric density ( $\log I_0/I$ ) in a 5 mm absorption

cell was measured at 500 m $\mu$  during the next 30 minutes in the dark, in the course of which the density increased by 0.0330. The other identical sample was similarly treated with the yellow light; its density increased only 0.0037 in the same time. To show that the yellow-bleached solution was nevertheless capable of more regeneration, it was then illuminated for 10 minutes with the blue light and its density again measured during 30 minutes in the dark. This time there was an increase in density of 0.0330. (The precise agreement is obviously accidental.)

The density was also measured at 450 m $\mu$  during these manipulations, and showed that the yellow-bleached sample had decreased considerably in density during its 10-minute exposure to blue. Apparently the marked regeneration found at 500 as well as at 450 m $\mu$  occurred only after this density decrease in blue-absorbing substance had taken place.

Whether this photolabile blue-absorbing substance is present in the unbleached visual purple solution or is a product of visual purple break-down is not decided by these data. Dr. E. L. Smith of this laboratory has suggested that it may be a flavin and is investigating this possibility at present. It is also uncertain whether the new material plays a primary rôle in vision in the same sense that visual purple does, or is important only for the resynthesis of visual purple in the dark.

The visual purple extractions which gave these results were obtained from winter frogs by the procedure that has already been described.<sup>1</sup> The photometric density measurements were made with a very sensitive photoelectric spectrophotometer designed by Dr. Simon Shlaer. The work was aided by a grant from the Rockefeller Foundation.

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<sup>2</sup> S. Hecht, A. M. Chase, S. Shlaer and C. Haig, *SCIENCE*, 84: 331, 1936.